

1 **CLAIMS**

2 What is claimed is:

3 1. A method for investigating messages passed in a message-passing environment,
4 comprising:

5 collecting a plurality of messages from at least one participant in the message-
6 passing environment;

7 assembling the messages into at least one message sequence;

8 analyzing said at least one message sequence to extract information regarding the
9 message-passing environment; and

10 outputting the information.

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12 2. The method according to claim 1, wherein the message-passing environment is
13 a network environment including plural participants coupled together via a network.

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15 3. The method according to claim 2, wherein the network uses an Internet
16 Protocol to transmit messages between participants.

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18 4. The method according to claim 2, wherein the messages express the
19 information in one of a plurality of message formats.

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21 5. The method according to claim 2, wherein the messages include information
22 expressed in a markup language.

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24 6. The method according to claim 5, wherein the markup language is the
25 extensible markup language (XML).

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2 7. The method according to claim 2, wherein the network uses Simple Object
3 Access Protocol (SOAP) to transmit messages between participants.
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5 8. The method according to claim 1, wherein the message-passing environment is
6 a machine or system including plural interacting components that function as message
7 participants.
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9 9. The method according to claim 1, wherein the message-passing environment is
10 a software program including plural interacting software modules that function as
11 message participants.
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13 10. The method according to claim 1, further comprising, after the collecting,
14 converting identifying information pertaining to said at least one participant into an
15 indication of a role played by the participant in the message-passing environment.
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17 11. The method according to claim 1, wherein the assembling comprises
18 combining multiple message traces into said at least one message sequence, each
19 message trace pertaining to one or more messages transmitted by and/or received at a
20 participant.
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22 12. The method according to claim 1, wherein the assembling comprises
23 assembling plural message sequences, and the analyzing comprises analyzing the plural
24 message sequences.
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1 13. The method according to claim 1, wherein the analyzing involves performing
2 cluster analysis to group said at least one message sequence into at least one cluster.

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4 14. The method according to claim 13, wherein the cluster analysis comprises:
5 forming a data matrix based on information in said at least one message sequence;
6 and
7 forming said at least one cluster based on the data matrix.

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9 15. The method according to claim 14, wherein the forming of the data matrix
10 involves extracting features from said at least one message sequence.

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12 16. The method according to claim 14, wherein the forming of the data matrix
13 involves forming a similarity measure which measures the difference between said at
14 least one message sequence and another message sequence.

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16 17. The method according to claim 13, wherein the analyzing involves identifying
17 results of the cluster analysis that may warrant further investigation.

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19 18. The method according to claim 1, wherein the analyzing comprises comparing
20 said at least one message sequence with a reference message sequence.

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22 19. A computer readable medium including machine readable instructions for
23 implementing the collecting, assembling, analyzing, and outputting recited in claim 1.

1 20. An apparatus for investigating messages passed in a message-passing
2 environment, comprising:

3 message aggregation logic configured to collect a plurality of messages from at
4 least one participant in the message-passing environment, and to assemble the messages
5 into at least one message sequence;

6 analysis logic configured to analyze said at least one message sequence to extract
7 information regarding the message-passing environment; and

8 output logic configured to output the information.
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10 21. The apparatus according to claim 20, wherein the message-passing
11 environment is a network environment including plural participants coupled together via
12 a network.
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14 22. The apparatus according to claim 21, wherein the network uses an Internet
15 Protocol to transmit messages between participants.
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17 23. The apparatus according to claim 21, wherein the messages express the
18 information in one of a plurality of message formats.
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20 24. The apparatus according to claim 21, wherein the messages include
21 information expressed in a markup language.
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23 25. The method according to claim 25, wherein the markup language is the
24 extensible markup language (XML).
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2 26. The apparatus according to claim 21, wherein the network uses Simple Object
3 Access Protocol (SOAP) to transmit messages between participants.
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5 27. The apparatus according to claim 20, wherein the message-passing
6 environment is a machine or system including plural interacting components that function
7 as message participants.
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9 28. The apparatus according to claim 20, wherein the message-passing
10 environment is a software program including plural interacting software modules that
11 function as message participants.
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13 29. The apparatus according to claim 20, wherein the message aggregation logic
14 is further configured to convert identifying information pertaining to said at least one
15 participant into an indication of a role played by the participant in the message-passing
16 environment.
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18 30. The apparatus according to claim 20, wherein the message aggregation logic
19 is further configured to combine multiple message traces into said at least one message
20 sequence, each message trace pertaining to one or more messages transmitted by and/or
21 received at a participant.
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23 31. The apparatus according to claim 20, wherein the message aggregation logic
24 is further configured to assemble plural message sequences, and the analysis logic is
25 further configured to analyze the plural message sequences.

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2 32. The apparatus according to claim 20, wherein the analysis logic is configured
3 to perform cluster analysis to group said at least one message sequence into at least one
4 cluster.

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6 33. The apparatus according to claim 32, wherein, in performing the cluster
7 analysis, the analysis logic is further configured to:

8 form a data matrix based on information in said at least one message sequence;
9 and

10 form said at least one cluster based on the data matrix.

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12 34. The apparatus according to claim 33, wherein the analysis logic is configured
13 to form the data matrix by extracting features from said at least one message sequence.

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15 35. The apparatus according to claim 33, wherein the analysis logic is configured
16 to form the data matrix by forming a similarity measure which measures the difference
17 between said at least one message sequence and another message sequence.

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19 36. The apparatus according to claim 32, wherein the analysis logic is further
20 configured to identify results of the cluster analysis that may warrant further
21 investigation.

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23 37. The apparatus according to claim 20, wherein the analysis logic is further
24 configured to compare said at least one message sequence with a reference message
25 sequence.

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2 38. A computer readable medium including machine readable instructions for
3 implementing the message aggregation logic, the analysis logic, and the output logic of
4 claim 20.

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6 39. An apparatus for investigating messages passed in a message-passing
7 environment, comprising:

8 means for collecting a plurality of messages from at least one participant in the
9 message-passing environment;

10 means for assembling the messages into at least one message sequence;

11 means for analyzing said at least one message sequence to extract information
12 regarding the message-passing environment; and

13 means for outputting the information.
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